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*List of Papers Communicated to the American Philosophical Society.  
By Pliny Earle Chase, LL.D.*

(Read before the American Philosophical Society, November 5, 1880.)

1. Sanscrit and English Roots and Analogues. Sept. 17, 1858, *P.\** vii, 177-91.
2. Chinese and Indo-European Roots and Analogues. Jan. 18, 1861, *P.* viii, 5-48.
3. Intellectual Symbolism. Oct. 3, 1862, *T.\** xii, 463-594.
4. Chinese Seal Inscriptions. Feb. 6, 1863, *P.* ix, 139.
5. Chinese Analogues in other languages. Feb. 20 to May 15, 1863, *P.* ix, 145, 172, 231.
6. Catalogue of Trade Tokens circulating during the war of the Rebellion. Sept. 18, 1863, *P.* ix, 242-58.
7. Mathematical Probability of Accidental Linguistic Resemblances. Sept. 18, 1863, *T.* xiii, 25-33.
8. Comparative Etymology of the Yoruba Language. Sept. 18, 1863, *T.* xiii, 35-68.
9. Note on Possible Vowel Sounds not used in any Language. Oct. 2, 1863, *P.* ix, 271.
10. On the Diurnal Variations of the Barometer; elastic actions and reactions proportioned to mass; cyclical motions in a resisting medium, furnishing *harmonic indications of Sun's mass and distance*; anticipation of astronomical verifications or rectifications by means of varying pressures; *importance of the fundamental equations,  $v = \frac{gt}{2}$ ;  $h = \frac{gt^2}{4}$* ; in which *t* represents the time of cosmical, molecular, or atomic rotation, and *g* represents the acceleration of a central force. Dec. 18, 1863, *P.* ix, 283-8 (Maxwell, Edlund, Crookes, Lockyer).†

The above was the first of a series of physical papers in confirmation of the following *General Postulate*. *All physical phenomena are due to an Omnipresent Power, acting in ways which may be represented by harmonic or cyclical undulations in an elastic medium.*

11. On the Height of the Tides; principles of (10) applied to the explanation of some tidal anomalies. Jan. 1, 1864, *P.* ix, 291-4.
12. Daily Distribution of Heat; coördinate thermodynamic influences of solar radiation, cyclical elasticity, and barometric pressure. March 4, 1864., *P.* ix, 345-9.
13. Mechanical modification of electric and other elastic currents; gravity, electricity and terrestrial magnetism regarded as "modes of motion" (Gray, Edison, Bell, Channing, Crookes); illustrations of the

\**P.*, *Proceedings*; *T.*, *Transactions*.

† The names in parentheses are those of subsequent investigators, whose researches have confirmed the conclusions of the papers.

- hypothesis that electricity consists simply of æthereal vibrations (Maxwell, Edlund). April 1, 1864, *P. ix*, 355-60.
14. Polarizing influences of thermal convection and radiation ; correspondence between Challis's laws of molecular action and the laws of attraction and rotation (Baumhauer, Meyer, Mendeleeff, Zaengerle). April 15, 1864, *P. ix*, 367-71.
  15. Lunar-monthly barometric variations ; resemblances to daily barometric fluctuations. June 17, 1864, *P. ix*, 395-9. Also, *Proc. Roy. Soc.* June 16, 1864, xiii, 329-333.
  16. Component elements of normal barometric tides ; influence of oscillations moving with the velocity of light. July 15, 1864, *P. ix*, 405-11.
  17. Comparative fitness of languages for musical expression. Sept. 16, 1864, *P. ix*, 419-20.
  18. Primitive names of the Supreme Being. Sept. 16, 1864, *P. ix* 420-4.
  19. Numerical Relations of Gravity and Magnetism ; Formulation of Hypothesis of Unity of Elastic Force ; Kinetic Ratio of Sound Waves to Light Waves (Edlund, Mendeleeff, Crookes, Lockyer, Edison). Oct. 21, 1864, *P. ix*, 425-40 ; *T. xiii*, 117-36.
  20. Comparison of Solar and Lunar Magnetic and Aerial Tides ; Magellanic medal awarded Dec. 16, 1864 (Maxwell, 1873). *P. ix*, 487-95.
  21. Radical Significance of Numerals. Feb. 17, 1865, *P. x*, 19-23.
  22. Copto-Egyptian Vocabulary. April 7, 1865, *P. x*, 69-94.
  23. Relations of Magnetic Declination to Gravity ; Heat and Attraction ; Different manifestations of the Force which controls Stellar-Systems as well as Molecular Motions. April 21, 1865, *P. x*, 97-104.
  24. Relations of Magnetic Inclination to Gravity ; Accomplishment of Faraday's Desideratum. May 19, 1865, *P. x*, 111-8.
  25. Experiments in Mechanical Polarization of magnetic needles by vibrations resembling those of Terrestrial convection and atmospheric currents : mechanical polarization of Sky Light. Oct. 6, 1865, *P. x*, 151-66.
  26. Observations on Skylight polarization at Philadelphia ; Remarkable visibility of all the neutral Points. Jan. 5, 1866, *P. x*, 196-7.
  27. Comparative visibility of Arago's, Babinet's, and Brewster's Neutral Points, in Philadelphia and its neighborhood. April 6, 1866, *P. x*, 223.
  28. Relations of Temperature to Gravity and Density ; General Equation of Oscillation and Parabolic motion ; Thermodynamic *vis viva* ; Comparative Energy of action and reaction at the source of Solar Radiation and at Earth's Orbit : simple harmonic relation between terrestrial gravity and the velocity of light. Sept. 21, 1866, *P. x*, 261-9.
  29. Laws regulating the distribution and transmission of Solar heat. Feb. 1, 1867, *P. x*, 309-15.
  30. Probabilities in etymology ; a reply to criticism. Sept. 20, 1867, *P. x*, 345-9.

31. Meteor seen at Haverford College. Oct. 4, 1867, *P. x*, 353.
32. Meteors of Nov. 13, 14, 1867. Nov. 15, 1867, *P. x*, 357.
33. Specific Magnetism of iron ; cosmical and molecular comparisons. Nov. 15, 1867, *P. x*, 358.
34. General connotations of magnetism ; accordance between barometric and astronomical estimates of Sun's distance. Feb. 21, 1868, *P. x*, 368-79.
35. Evidences of Lunar influence on rainfall. June 19, 1868, *P. x*, 436-9.
36. Tidal Rainfall of Philadelphia ; similarity of influence in different independent periods. Dec. 4, 1868, *P. x*, 523-37.
37. Meteors of Nov. 13, 14, 1868. Dec. 4, 1868, *P. x*, 539.
38. Philadelphia Life Tables. Feb. 5, 1869, *P. xi*, 17-22.
39. Cosmical relations of light to gravity ; influence of the *modulus* of light, velocity, mass, distance, centres of gyration, orbital eccentricity, inertia, and ratio of circumference to diameter on cosmical and molecular phenomena (Alexander, 1877); solar centripetal reaction against the action of gravity towards the centre of the solar system gives *the velocity of light* in the fundamental equation  $v = \frac{gt}{2}$ . April 2, 1869, *P. xi*, 103-7.
40. Comparison of rainfall at Greenwich and Philadelphia ; cosmical and local influences upon meteorology. May 7, 1869, *P. xi*, 113.
41. Tidal Rainfall ; comparison of lunar influences at Providence, Chiswick and Toronto. Oct. 1, 1869, *P. xi*, 203.
42. Comparison of mechanical Equivalents. Jan. 7, 1870, *P. xi*, 313.
43. Monthly variations of rainfall at Philadelphia. Feb. 4, 1870, *P. xi*, 314-5.
44. European and American rainfall ; comparison of quarterly rains at Philadelphia and Lisbon. March 3, 1871, *P. xii*, 38-9.
45. American Weather Notes ; local influences ; importance of gradients ; frequency of anticyclonic storms ; local cyclones in general anticyclones (Signal Service). March 3, 1871, *P. xii*, 40.
46. Winds of the United States ; General anticyclonism ; storm centres at normal intersections of prevailing currents. March 17, 1871, *P. xii*, 65-7.
47. Resemblance of atmospheric, magnetic and oceanic currents ; primary coördinate great circles ; uniform evidences of gravitating influence. April 7, 1871, *P. xii*, 68-70.
48. Relation of Auroras to gravitating currents. May 5, 1871, *P. xii*, 121-2.
49. Winds of Europe. June 16, 1871, *P. xii*, 123.
50. Normal position of the tidal ellipsoid. June 16, 1871, *P. xii*, 123-4.
51. Cyclical Rainfalls at Lisbon ; solar and lunar influences compared at different independent periods ; blending tidal currents of different temperatures and different degrees of humidity. Aug. 18, 1871, *P. xii*, 178-90.
52. Correlations of cosmical and molecular force ; harmonic estimates of solar mass and distance from the explosive energy of oxygen and hy-

- drogen (Young) ; *vis viva* of wave propagation =  $\frac{5}{8}$  of the *vis viva* of oscillating particles (Maxwell, 1877). Feb. 16, 1872, *P. xii*, 392-4.
53. The Herschel-Stephenson Postulate ; conditions of stability in elastic atmospheres ; influences of centres of oscillation on planetary masses, distances, and times of rotation. March 1, 1872, *P. xii*, 395-7.
54. Further approximations to sun's distance ; accordant harmonies of terrestrial rotation, lunar distance, lunar revolution, explosive energy, and the velocity of light. April 5, 1872, *P. xii*, 398-400.
55. General relation of Auroras to Rainfall. April 5, 1872, *P. xii*, 400.
56. Influence of meteoric showers on Auroras. May 16, 1872, *P. xii*, 401-3.
57. Planetary Illustrations of Explosive Oscillation ; apsidal and mean positions and eccentricities (Alexander, 1877). May 16, 1872, *P. xii*, 403-5.
58. Undulatory harmonies of solar and planetary rotation, revolution, mass, gravity, and light. May 16, 1872, *P. xii*, 406-7.
59. Aethereal density and polarity ; influences on cosmical masses and relative positions. May 16, 1872, *P. xii*, 407-10.
60. The sun-spot cycle of 11.07 years ; wave-cycle of Jupiter's projectile locus (mean perihelion distance). May 16, 1872, *P. xii*, 410-1.
61. Aethereal Oscillation, the primordial material Force ; cardinal centres of wave influence ; planetary illustrations. July 5, 1872, *P. xii*, 411-7.
62. Daily auroral and meteoric means. Sept. 20, 1872, *P. xii*, 516-8.
63. Stellar and Planetary Correlations ; relations of distance to cardinal points of explosive oscillation ; rupturing velocities acquired by nebular "subsidence" from  $nd$  to  $\frac{nd}{n+1}$  ; evidences of parabolic projection between  $\alpha$  Centauri and sun, *the locus of the paraboloid being determined by the solar modulus of light, sun's linear centre of oscillation, and sun's gravitating reaction against luminous undulation* ; harmonic positions of loci of planetary rupturing velocities. *These are the only POSITIVE evidences yet discovered of gravitating influence between different stellar systems.* Sept. 20, 1872, *P. xii*, 518-22.
64. Cyclical rainfall at San Francisco ; indications of planetary as well as lunar influence. July 19, 1872, *P. xii*, 523-42.
65. Recent monthly Rainfall in the United States ; compiled from Signal Service reports ; lunar influence less disguised than solar. Nov. 1, 1872, *P. xii*, 555-7.
66. Lunar-cyclical Rainfall in the northern Temperate Zone. Nov. 1, 1872, *P. xii*, 558-9.
67. Oscillatory Forces in the Solar system ; harmonies of apsidal and mean planetary positions and moments of inertia ; influence of the ratio of the circumference to the diameter of a circle (Forbes, 1880). Feb. 7, 1873, *P. xiii*, 140-1.
68. Estimate of solar mass and distance from the equilibrium of elastic and gravitating forces. Feb. 7, 1873, *P. xiii*, 142-3.

69. Note on Planeto-Taxis ; reasons for limitations of "Bode's law." March 7, 1873, *P. xiii*, 143-4.
70. Rotation of the sun and the Intra-asteroidal Planets. March 7, 1873, *P. xiii*, 145-7.
71. Planetary relations to the sun-spot period. March 7, 1873, *P. xiii*, 147-8.
72. Relative velocities of light and gravity. March 7, 1873, *P. xiii*, 148-9.
73. The gamuts of sound and light ; correspondence of wave-length of the musical note,  $C_{23}$ , with that of the Fraunhofer C line ; approximations in other wave-lengths of the two gamuts ; comparative harmonic estimates of solar mass and distance ; indications of a magnetic gamut, four octaves below that of light. March 21, 1873, *P. xiii*, 149-54.
74. The music of the spheres ; apsidal and mean relations to musical intervals. April 4, 1873, *P. xiii*, 193-8.
75. Harmonic Indications of Intra-Mercurial planets ; influence of Neptune, Jupiter and Sun in establishing harmonic nodes of planetary aggregation ; *prediction of an "unknown planet or other seat of solar and planetary perturbation"* (De la Rue, Stewart and Loewy, Watson, Mouchez, Oppolzer, and others). May 2, 1873, *P. xiii*, 237-9.
76. Correlations of Planetary mass. May 16, 1873, *P. xiii*, 239-43.
77. Harmonies of Cosmical Rotation. May 16, 1873, *P. xiii*, 243-8.
78. Weather Study ; confirmation of views (45, 46) by observations of signal service bureau. May 16, 1873, *P. xiii*, 248-52.
79. The Planetary node between Mercury and Vulcan. May 16, 1873, *P. xiii*, 252.
80. Recent Confirmation of an Astronomical Prediction. Oct. 3, 1873, *P. xiii*, 470.
81. Comparison of Planetary Series ; harmonic series the closest of all. Oct. 3, 1873, *P. xiii*, 471-7.
82. Transcript of a curious MS. work in cypher, supposed to be astrological. Oct. 3, 1873, *P. xiii*, 477-82.
83. Origin of Attractive Force. Feb. 6, 1874, *P. xiv*, 111-4.
84. Saving Fund Life Insurance. April 3, 1874, *P. xiv*, 148-9.
85. Cosmical Thermodynamics ; fifty postulates of unitary force, with references to illustrative papers. April 17, 1874, *P. xiv*, 141-7.
86. Cosmical evolution ; relations of mean proportionality to time, mass, density, and the velocity of light. May 15, 1874, *P. xiv*, 159-61.
87. Jupiter-cyclical Rainfall. June 19, 1874, *P. xiv*, 193-5.
88. Cyclical rainfall at Barbados. June 19, 1874, *P. xiv*, 195-216.
89. Gravitating Waves ; important nodal positions of Sun, Earth and Jupiter. Jan. 1, 1875, *P. xiv*, 344-6.
90. Lunar monthly Rainfall in the United States, from observations of the Signal Service Bureau. April 16, 1875, *P. xiv*, 416-8.
91. Further Relations of Magnetic, Gravitating and Luminous Force ; analogous equations in general physics, electricity, chemistry, and

- cosmogony; consequent estimate of Sun's mass, from Maxwell's magnetic data. June 18, 1875, *P.* xiv, 607-9.
92. Planetary Illustrations of the Creative Fiat. Aug. 20, 1875, *P.* xiv, 609-12.
93. Yearly rainfall in the United States, from observations of the Signal Service Bureau. Aug. 20, 1875, *P.* xiv, 613-4.
94. The Beginnings of Development; planetary linkages; *the velocity of light is the limit between the living forces of association and dissociation*; variety of rhythmical relations; successive steps of nebular condensation. Sept. 17, 1875, *P.* xiv, 622-31.
95. Further Dynamic Coördinations; *mathematical deduction of the ratio between the mean vis viva of gaseous volume (heat under constant volume) and the vis viva of uniform velocity (heat under constant pressure)*; harmonies of products and powers of mass and distance. Dec. 3, 1875, *P.* xiv, 651-8.
96. Nebular action in the solar system; confirmations of Herschel's theory of "subsidence;" electrical conductivity of selenium, illustrating the ratio of velocities between solar waves originating at Sun's surface and in Earth's orbit (Bell, Tainter). April 21, 1876, *P.* xvi, 184-92.
97. On some fundamental propositions of central force; nucleal radius varying as the  $\frac{2}{3}$  power of the atmospheric radius; oscillatory formulas of cyclical motion; views of various investigators; universal correlations. July 21, 1876, *P.* xvi, 298-310.
98. Aethereal influences in the solar system; evidence of 58 accordances. Jan. 5, 1877, *P.* xvi, 496-505.
99. Chemical atoms, molecules and volumes; laws of Boyle, Charles, and Avogadro. Feb. 2, 1877, *P.* xvi, 505-8.
100. Further illustrations of central force; increase of velocity through "subsidence" should produce rupture in the periphery of a stationary nebula at  $\frac{r}{n}$  when  $n = 2 \div (3 - 2\sqrt{2})$ ; this influence shown by various planetary belts and positions; "subsidence" tending to form confocal elliptic orbits, with major axes of  $\frac{3r}{2}$  and minor axes  $\frac{1}{2}r$ , and belts, on account of collision, at  $\frac{2r}{3}$ ; influence of the modulus of light and various ratios in positing planetary belts. July 20, 1877, *P.* xvii, 98-100.
101. Harmonies of solar spectrum; identity of law in luminous and planetary nodes. August 24, 1877, *P.* xvii, 109-12.
102. Results of wave interference; symmetrical formula, introducing masses of Sun and Jupiter, Sun's equatorial radius, Jupiter's projectile radius, and the velocity of light; significance of Earth's position and density; cosmical and molecular wave lengths: confirmation of "subsidence" and of harmonic undulations, by the moons of Earth, Mars, Jupiter, Saturn, and Uranus; *Alexander's adoption and confir-*

- mation of my harmonic predictions.* Jan. 18, 1878, *P.* xvii, 294-307.
103. Criteria of the Nebular Hypothesis. March 1, 1878, *P.* xvii, 341-5.
  104. Radiation and rotation; explanation of Kirkwood's analogy; belts of planetary pairs. June 21, 1878, *P.* xvii, 701-4.
  105. Crucial Harmonies; nine confirmations of prediction. Oct. 4, 1878, *P.* xviii, 34-6.
  106. The limiting constant of gravitation; new method of identifying the velocity of light with gravitating force. Oct. 18, 1878, *P.* xviii, 41-3.
  107. The Philosophy of Christianity. Feb. 7, 1879, *P.* xviii, 129-53.
  108. Further confirmations of prediction; two additional evidences of harmonic solar disturbance. Feb. 21, 1879, *P.* xviii, 209.
  109. Harmonies of Lockyer's "Basic Lines;" the fundamental wave-length representing a centre of spherical gyration, in Earth's reaction against solar action; the other lines all harmonic. April 4, 1879, *P.* xviii, 224-6.
  110. Spectral estimates of Sun's distance. April 4, 1879. *P.* xviii, 227-9.
  111. Correlations of mass; equations between masses of Sun and four outer planets; centres of various nebular influences. April 4, 1879, *P.* xviii, 229-32.
  112. Approximate quadrature of the circle. June 20, 1879, *P.* xviii, 281.
  113. Apparent semi-diameter of the Sun, and nebular origin of the terrestrial day. Dec. 19, 1879, *P.* xviii, 380-1.
  114. Velocity of light and Kirkwood's analogy; *five estimates of the velocity of light based on the Nebular Hypothesis.* Jan. 2, 1880, *P.* xviii, 425-9.
  115. Controlling centres; various estimates of mass and distance according to the Nebular Hypothesis. Jan. 2, 1880, *P.* xviii, 429-34.
  116. Nodal estimate of the velocity of light. March 19, 1880, *P.* xviii, 4-9.
  117. Cometary Paraboloids; comparison of planetary positions as determined by inter-stellar action, with M. Gaussin's geometrical approximations; stellar approximations the closest. April 16, 1880, *P.* xviii, 18-20; also *Comptes Rendus*, 19 Avril and 3 Mai, 1880, *T.* xc. pp. 912, 1061.
  118. Cosmical determination of Joule's equivalent; correspondence of centrifugal "lift," indicated by the difference of polar and equatorial temperatures, with the centripetal fall which would give the equatorial velocity of rotation; confirmation of Clarke's discovery, that the molecular volume of chemically combined water is variable, while that of crystal water, or molecularly united water, is invariable. April 16, 1880, *P.* xviii, 20-1.
  119. Relations of Chemical Affinity to Luminous and Cosmical Energies; simple ratio of mean molecular velocities in gases, to velocities of terrestrial rotation and revolution; harmonic wave-lengths in Vogel's hydrogen and Paalzow's oxygen-spectra. April 16, 1880, *P.* xviii, 21-5.